National Aeronautics and Space Administration

Lyndon B. Johnson Space Center White Sands Test Facility P.O. Box 20 Las Cruces, NM 88004-0020



Reply to Attn of:

June 12, 2003

RF-03-111

Lockheed Martin Space Mission Systems & Services Attn: Ms. Christina Hardeway/MS B22 2400 NASA Road One Houston, TX 77058

SUBJECT Corrected Materials Test Data Transmittal

Enclosed is the corrected copy of WSTF 03-37454 performed at the NASA Johnson Space Center White Sands Test Facility (WSTF) laboratories. The report was transmitted with the following error:

• A calibration check of the balance used to weigh this article revealed that the required accuracy of the weight measurement according to NASA-STD-6001 might not have been met. The weight of the article was adjusted to reflect the accuracy of the nearest weight measurement checkpoint.

All changes have been made and are indicated on the corrected copy by revision bars. Please replace the original report, transmitted earlier, with the enclosed corrected copy.

Please direct any questions that may arise from this data transmittal to Dave Baker at telephone (505) 524-5605.

Harry T. Johnson

Chief, Laboratories Office

Enclosure

cc:

LMES/C45/A. Tucker

# **CORRECTED COPY**

NASA JSC TEST REQUEST							OFFICE USE ONLY	
Note to test facility: A copy of this request should be returned with test report.							TEST FACILITY I. D. NUMBER	
The second secon							03-37454	
NAME ORGANIZATION						COORDINATOR		
Andrew Tucker Lockheed Martin						ch		
ADDRESS							REQUEST NO. 12462	
2400 NASA RD ONE							TEST FACILITY	
Mail Code C45							WSTF	
Houston, Tx 77058	CODE							
DATE PHONE 281-483-7451								
January 22, 2003	1							
1. MANUFACTURER'S IDENTIFICATION	Nem Des	ription)		2.	MAN	IUFACTURER'S NAME	<u> </u>	
MD8 Air Sampling Device	(IEEIII SES	ortpuon,		s	arto	rious		
	_	4. CHEMICAL	CLACC		GEN	ERIC USE		
3. SPECIFICATION		Assembly	CDGG	٦				
6. CHECK CATEGORY NASA-STD-600	1	7. TEST REQU	UIRED NASA ST	D-6001				
		חחחר						
A B C		1 2 3 4	5678	9 10 11	12 1	3 14 15 16 17 18	VCM TOCM SPECIAL VAC BAKE  9. USE TEMPERATURE	
8. VEHICLE		NUMBER & SE	RIAL NO.	8. PROJ	JECT		Ambient; Cabinet	
ISS and Shuttle	17801				<u>-</u>			
12. USE ATMOSPHERE/FLUID	13. IGN	TER TYPE	7-	14. USE Std Ca	E PRE: abin	ssure Pressure; 14.7psi	15. USE THICKNESS	
16. INTENDED APPLICATION			17.	QUANTITY	INHA	BITABLE AREA/HAZARD	OUS FLUID/VACUUM	
Air Sampling			""	20/21///				
18. CURE TIME		19. CURE TE	EMPERATURE	_		20. CURE PRESSURE		
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21. TEST ARTICLE WEIGHT		T ARTICLE ARE	EA	1	3. NUMBER OF ITEMS TESTED		24. NUMBER OF ITEMS TO BE FLOWN	
4.5 kg	•	6" x 6"		1				
25. TEST CHAMBER VOLUME		T CHAMBER AT				AMBER PRESSURE	28. TEST CHAMBER TEMPERATURE	
		O2/79.1% N	2 	11.8 ~		-	DUOTOCDADUIC COMEDACE	
29. TEST CHAMBER DURATION	30. CLE	ANING SPEC		31. MA	31. MATERIAL CODE		32. PHOTOGRAPHIC COVERAGE	
						<u></u>	UNDEO STILLS INONE	
33. SPECIAL INSTRUCTIONS								
1. Hardware to be tested is liste	d belov	ı:						
Air Sampling Device Part # 17801								
2. Record Test Chamber Volum	e.						·	
2. 180010 1001 0111111011							<b>~</b>	
3. Contact Andrew Tucker (281-483-7451) or Micah Johnson (281-483-7422) when hardware arrives at testing facility and when								
3. Contact Andrew Tucker (201-	403-/4: :e tostin	or) or micali	JUINSON (20	1-403-144	LL, **			
hardware has completed offgass testing.								
	•							
1								

# **CORRECTED COPY**

Page 2 WSTF # 03-37454 JSC # 12462

## AUTHORIZATIONS, SPECIAL INSTRUCTIONS, AND NOTES

FROM

DATE

INSTRUCTIONS

**WSTF** 

The test article was returned to the requested address.

Page 3 WSTF # 03-37454 JSC # 12462

# NASA STD 6001 TEST 7: DETERMINATION OF OFFGASSED PRODUCTS NON-STANDARD TEST \*

#### ASSEMBLED ARTICLE

MD8 Air Sampling Device

## TEST ARTICLE DESCRIPTION

Weight: 2632 g

Preparation Information

The test article consisted of a MD8 Air Sampling Device with four plastic adapters.

Pretest Photograph(s): NASA-WSTF 0203-0252

#### TEST CONDITIONS

Test Chamber Volume: 34.5 liters

Test Atmosphere: 79.1% Nitrogen

20.9% Oxygen

Test Pressure: 82.0 kPa (11.9 psia)

Test Temperature: 49 °C (120 °F)

Test Duration: 72 Hr

Additional Information

The concentration of nitrogen dioxide in the test matrix gas cannot be verified at the specification limit.  $\mbox{\ensuremath{\star}}$ 

Page 4 WSTF # 03-37454 JSC # 12462

# TEST RESULTS, OBSERVATIONS, AND COMMENTS

## TABLE 1. TEST RESULTS

Component	NASA Code	SMAC (milligrams/ cubic meter)	Quantity (micrograms /assembled article)
1 1 Dichloro 1 fluoroothano	071585	150	130
1,1-Dichloro-1-fluoroethane	055100	36	39
1,3-Dioxolane	014950	<b>73</b> .7	7400
I-Methoxy-2-propanol I-Methoxy-2-propyl acetate	045630	61	5800
3-Methylpentane	095400	176	3.3
Acetaldehyde	020300	4	38 490
Acetone	110500	5Ó	490
Benzene	030400	1.5	22 5.0
Butene	097601	57	5.0
Butylbenzene	033700	55 17.7	86
Butyraldehyde	021500	17.7	6.9
12 Ketones	119703 118711	0.1 23.5	220
7 Ketone	118711	23.5	39 18
C7 Saturated and unsaturated aliphatic hydrocarbons	098540	201	
C8 Saturated aliphatic hydrocarbon	098741	228.19	4.5
19.010 Aromatic hydrocarbons	038210	15	2400
C9-C10 Aromatic hydrocarbons Carbon disulfide	121000	$\begin{array}{c} 15 \\ 3.1 \end{array}$	43
Carbon monoxide	161000	10	180
Carbonyl sulfide	122000	4.9	54
Cyclohexane	091650	205.16	320
Dichloromethane	064200	<b>5</b> 0 _	<u> 360</u>
Dimethoxymethane	050500	114.5	170
Ethylbenzene	031600	130	300

Page 5 WSTF # 03-37454 JSC # 12462

TABLE 1. TEST RESULTS

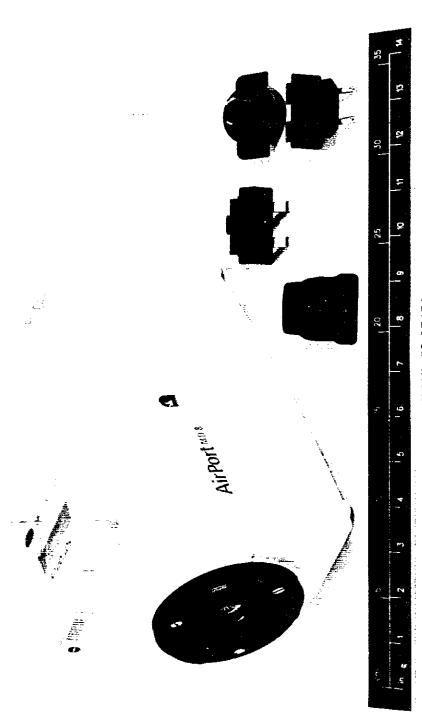
Heptane Hexamethylcyclotrisiloxane Hexame Hydrogen Isopropylbenzene Methane Methyl alcohol Methyl ethyl ketone n-Butane n-Butyl acetate	NASA Code 092840 093750 164500 094200 161500	SMAC (milligrams/ cubic meter)  5 204.47 90 176	Quantity (micrograms /assembled article)  14 37 100 9.0
Heptane Hexamethylcyclotrisiloxane Hexame Hydrogen Isopropylbenzene Methane Methyl alcohol Methyl ethyl ketone n-Butane n-Butyl acetate	)93750 164500 )94200 161500	204.47 90 176	37 100 9.0
n-Butyl alcohol n-Propyl acetate Propylbenzene t-Butyl alcohol Toluene Trimethyl benzenes Unidentified nitrogen containing component Unidentified nitrogen containing	030800 094500 014800 115000 090600 041200 011600 045600 012400 012400 035200 038851 999961 039100	340 73.27 3800 9 30 236.57 189.11 80 166.78 48.92 120.73 60 60.3 0.1	720 110 11 180 33 1.7 8700 780 16 250 4900 27 2800 28

Note(s): Toxic Hazard Index (T) 0.049 is based on use of the assembled item in a 65-cubic-meter spacecraft.

A SMAC Value of 0.1 milligrams/cubic meter is a conservatively low default value assigned initially to components for which toxicity data are not available. The T value is subject to change as toxicity data become available for these compounds.

### Observations and Comments

Calibration check of the balance used to weigh this article revealed that the required accuracy of the weight measurement according to NASA-STD-6001 might not have been met. The weight of the article has been adjusted to reflect the accuracy of the nearest weight measurement checkpoint.



WSTF NO. 03-37454 MD8 Air Sampling Device NASA-STD-6001 TEST 7

**CESS-0252** 

National Aeronautics and Space Administration

Lyndon B. Johnson Space Center White Sands Test Facility P.O. Box 20 Las Cruces, NM 88004-0020



FEB 24 2003

Reply to Attn of

RF

Lockheed Martin Space Mission Systems & Services

Attn: Ms. Christina Hardeway/MS B22

2400 NASA Road One Houston. TX 77058

Subject: Materials Test Data Transmittal

Enclosed are the results of tests recently performed at the NASA Johnson Space Center (JSC) White Sands Test Facility (WSTF) laboratories. The test requests are identified by both JSC log number, if assigned, and WSTF log number.

Please direct any questions that may arise from this data transmittal to James Williams at telephone number (505) 524-5543.

Special Williams

Harry T. Johnson Chief, Laboratories Office

Enclosure

cc: LMES/C45/A. Tucker

Post-It™ brand fax transmittal n	nemo <b>76</b> .	71 e of pages >
TO M-TCAH JEHNSON	Frem	MOREN LICKER
ca Lockheed	Co.	
Dept.	Phone #	x37451
Fax 483 4951	Fex#	244.5332

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N	TEST FACILITY I. D. NUMBER					
Note to test facility: A copy of this reques	at should t	SE LETITION IN IT	) teat teber			03-37454
						COORDINATOR
NAME			ORGANIZATION Lockheed Martin			ch
Andrew Tucker			FOCKNES	M MIDITUM		
ADDRESS			·			REQUEST NO.
2400 NASA RD ONE						TEST FACILITY
Mail Code C45						WSTF
Houston, Tx 77058						CODE
DATE		PHONE			ŕ	5552
January 22, 2003		281-483-74	isi Abu alsa N	Alcab Jot	nson at 281-483-7422)	
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MD8 Air Sampling Device	•	•			Sartorious	
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			CLACE		1. GENERIC USE	
3. SPECIFICATION		4. CHEMICAL Assembly				
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E. CHECK CATEGORY NASA-STD-800	1	7. TEST REC				
					11 12 13 14 15 16 17 18  ROJECT	VOM TOCK SPECIAL VAC BAVE
A B C		1 2 3 4	5 6 7	B 9 10	11 12 13 14 15 16 17 18	8. USE TEMPERATURE
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12. USE ATMOSPHEREFLUID	11 IGN	ITER TYPE		" 14.	USE PRESSURE	15. USE THICKNESS
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16. INTENDED APPLICATION				17. QUAÑ	TITY MHABITABLE AREAMAZAS	RDOUS FLUID/VACUUM
Air Sampling						·
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18. CURE TIME		19. CURE	EMPERMIN	M-		
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4.5 kg		6" x 6"		1		
1 112 - 2	┸——		TMOSPHER	E 27.	TEST CHAMBER PRESSURE	28. TEST CHAMBER TEMPERATURE
THE STATE CHAMPSO VICE LINE				1 4 4	.8 - 12.0 psia	
25. TEST CHAMBER VOLUME	26. TE:	02/79.1% N	12		••	1
	20.9%	02/79.1%	N2		MATERIAL CODE	32. PHOTOGRAPHIC COVERAGE
25. TEST CHAMBER VOLUME 29. TEST CHAMBER DURATION	20.9%	O2/79.1% NEANING SPEC	N2 			
29, TEST CHAMBER DURATION	20.9%	02/79.1%	N2 			32. PHOTOGRAPHIC COVERAGE  □ VIDEO STILLS □ NONE
	20.9%	02/79.1%	<b>12</b>			
29, TEST CHAMBER DURATION  35. SPECIAL INSTRUCTIONS	20.9% 36. CL	02/79.1% N	N2			
29. TEST CHAMBER DURATION  39. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed.	20.9%	02/79.1% N	<b>12</b>			
29, TEST CHAMBER DURATION  35. SPECIAL INSTRUCTIONS	20.9%	02/79.1% N				
29. TEST CHAMBER DURATION  39. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed.	20.9%	02/79.1% N	<b>12</b>			
29. TEST CHAMBER DURATION  35. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed Air Sampling Device Part #	20.9% 36. CL	02/79.1% N				
29. TEST CHAMBER DURATION  39. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed.	20.9% 36. CL	02/79.1% N	<b>12</b>			
29. TEST CHAMBER DURATION  35. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed.  Air Sampling Device Part #  2. Record Test Chamber Volume	20.9% 36. CLI ed below 17801	02/79.1% NEANING SPEC		31.	MATERIAL CODE	U VEEO STILLS I NONE
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29. TEST CHAMBER DURATION  35. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed Air Sampling Device Part #  2. Record Test Chamber Volum  3. Contact Andrew Tucker (281)	20.9% 36. CLI ed below 17801 ne.	02/79.1% NEANING SPEC		31.	MATERIAL CODE	
29. TEST CHAMBER DURATION  35. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed.  Air Sampling Device Part #  2. Record Test Chamber Volume	20.9% 36. CLI ed below 17801 ne.	02/79.1% NEANING SPEC		31.	MATERIAL CODE	U VEEO STILLS I NONE
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29. TEST CHAMBER DURATION  35. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed Air Sampling Device Part #  2. Record Test Chamber Volum  3. Contact Andrew Tucker (281)	20.9% 36. CLI ed below 17801 ne.	02/79.1% NEANING SPEC		31.	MATERIAL CODE	U VEEO STILLS I NONE
29. TEST CHAMBER DURATION  38. SPECIAL INSTRUCTIONS  1. Hardware to be tested is listed Air Sampling Device Part #  2. Record Test Chamber Volum  3. Contact Andrew Tucker (281)	20.9% 36. CLI ed below 17801 ne.	02/79.1% NEANING SPEC		31.	MATERIAL CODE	U VEEO STILLS I NONE

JSC Form 2035

BLDG 15 RDOM 250 Fax:281-244-5332 Mar 4 2003 11:34 P.03

Page 2 WSTF # 03-37454 JSC # 12462

# AUTHORIZATIONS, SPECIAL INSTRUCTIONS. AND NOTES

FROM DATE INSTRUCTIONS

WSTF .. The test article was returned to the requested address.

MAR 04 '03 11:44

281 244 5332

PAGE.03

NASA STD 6001 DETERMINATION OF OFFGASSED PRODUCTS NON-STANDARD TEST \* TEST 7:

## ASSEMBLED ARTICLE

MD8 Air Sampling Device

## TEST ARTICLE DESCRIPTION

Weight: 2631.70 g

Preparation Information

The test article consisted of a MD8 Air Sampling Device with four plastic adapters.

Pretest Photograph(s): NASA-WSTF 0203-0252

## TEST CONDITIONS

Test Chamber Volume: 34.5 liters

79.1% Nitrogen 20.9% Oxygen Test Atmosphere:

Test Pressure: 82.0 kPa (11.9 psia)

Test Temperature: 49 °C (120 °F)

Test Duration: 72 Hr

Additional Information

The concentration of nitrogen dioxide in the test matrix gas cannot be verified at the specification limit. \*

Page 4 WSTF # 03-37454 JSC # 12462

## TEST RESULTS, OBSERVATIONS, AND COMMENTS

TABLE 1. TEST RESULTS

Component	NASA Code	SMAC (milligrams/ cubic meter)	Quantity (micrograms /assembled article)
1.1-Dichloro-1-fluoroethane 1.3-Dioxolane 1-Methoxy-2-propanol 1-Methoxy-2-propyl acetate 3-Methylpentane Acetaldehyde Acetane	071585 055100 014950 045630 095400 020300 110500 030400	150 36 73.7 61 176 4 50 1.5	130 39 7400 5800 3.3 38 490
Benzene Butene Butylbenzene Butyraldehyde C12 Ketones C7 Ketone C7 Şaturated and unsaturated	097601 097601 033700 021500 119703 118711 098540	57 55 17.7 0.1 23.5 201	490 22 5.0 86 6.9 220 39 18
aliphatic hydrocarbons C8 Saturated aliphatic	098741	228.19	4.5
hydrocarbon C9·C10 Aromatic hydrocarbons Carbon disulfide Carbon monoxide Carbonyl sulfide Cyclohexane Dichloromethane Dimethoxymethane Ethylbenzene	038210 121000 161000 122000 091650 064200 050500 031600	15 3.1 10 4.9 205.16 50 114.5	2400 43 180 54 320 360 170 300

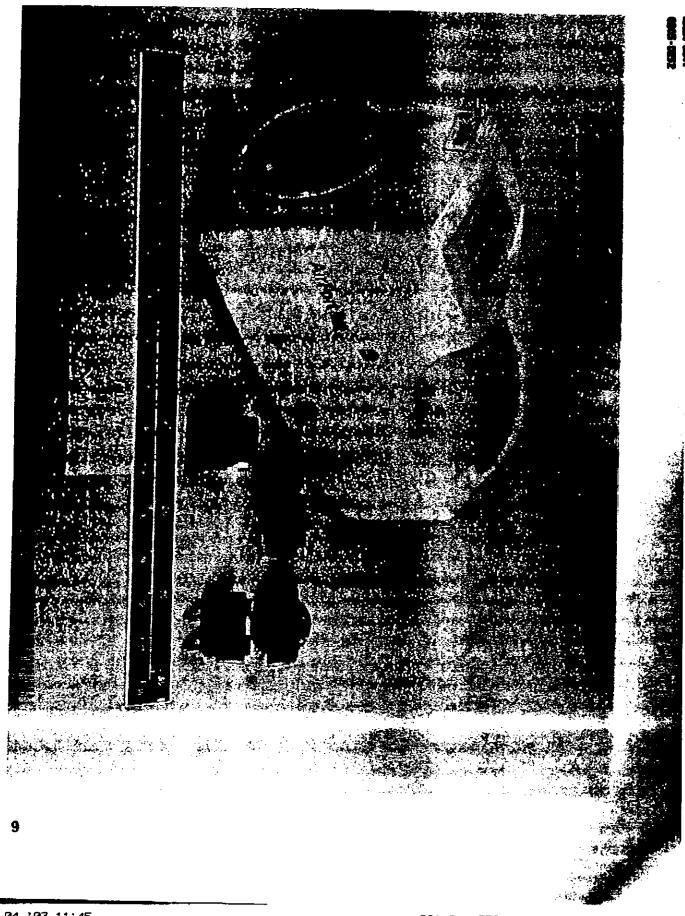
Page 5 WSTF # 03-37454 JSC # 12462

TABLE 1. TEST RESULTS

Component	NASA Code	SMAC (milligrams/ cubic meter)	Quantity (micrograms /assembled article)
Ethylcyclobutane Heptane Hexamethylcyclotrisiloxane Hexane Hydrogen Isopropylbenzene Methane Methyl alcohol Methyl ethyl ketone n-Butane n-Butyl acetate n-Butyl alcohol n-Propyl acetate Propylbenzene t-Butyl alcohol Toluene Trimethyl benzenes Unidentified nitrogen containing component Unidentified nitrogen containing component Xylenes	092840 093750 164500 094200 161500 030800 094500 014800 115000 041200 011600 045600 034000 035200 038851 999961 039100	204.47 90 176 340 73.27 3800 9 30 236.57 189.11 80 166.78 48.92 120.73 60 60.3 0.1 0.1	14 37 100 9.0 720 110 11 180 33 1.7 8700 780 16 250 4900 27 2800 28 4.9

Note(s): Toxic Hazard Index (T) 0.049 is based on use of the assembled item in a 65-cubic-meter spacecraft.

A SMAC Value of 0.1 milligrams/cubic meter is a conservatively low default value assigned initially to components for which toxicity data are not available. The I value is subject to change as toxicity data become available for these compounds.



MAR 04 '03 11:45

281 244 5332

#### JOHNSON, MICAH (JSC-EB) (LM)

From: Kao, Henry [henry.kao@lmco.com]

Sent: Monday, September 23, 2002 3:32 PM

To: JOHNSON, MICAH (JSC-EB) (LM)

Cc: Gabiola, Rudy

Subject: RE: Materials Question for new device...

Micah,

All the nonmetallic materials that well be used on the IVA application have to be check on flammability and toxicity from material safety viewpoint. Regarding the toxicity, you mentioned the offgassing test data would be nice; but, I can't make assessment for you without exact test data. For flammability, as I knew the exterior housing of this Satorius Airport MD8 is made by polyurethane base foam and coated with polyurethane paint. Basically, polyurethane is a very flammable materials, a flammability configuration analysis per JSC 29353 is required for this nonmetallic housing.

Let me ask you some questions?

- 1. What is the maximum oxygen concentration in the use environment? 24.1%, 30% or higher?
- 2. If the total quantities of all the flammable materials used in this equipment is larger than 0.1 lb (or 6 linear inches dimension and/or 10 square inches in manned crew environments?
- 3. Is there any ignition source near to this equipment?
- 4. Is there any other flammable materials near to this equipment during the usage? If yes, what is this material and how far the distance?
- 5. Is there any fire propagation path with this equipment?
- 6. Is there any fire barrier materials around these equipment?
- 7. Is this equipment will be stowed in a container or exposed to the cabin environment? If they are stowed in a container, is it a sealed container or vented container?
- 8. At worst condition (short circus), what is the maximum power of this equipment? and temperature will be?
- 9. Do you still have some other options for the housing materials of this equipment?
- 10. Could you cover or wrap this housing with some non-flammable materials?
- 11. If this equipment always will be stowed when not in use? How frequency and duration it will be exposed to cabin environment during the usage?
- 12. If this equipment is always hold or contacted with crew intimately during the usage?

All the information above should be helpful to conduct the flammability configuration analysis for this equipment.

Thanks,

## Henry Kao

Materials Engineer Ph.D.

#### M&P Group/Lockheed Martin

Phone: (281) 333-7345

----Original Message-----

From: JOHNSON, MICAH (JSC-EB) (LM) [mailto:micah.johnson1@jsc.nasa.gov]

Sent: Monday, September 23, 2002 10:14 AM

To: 'henry.kao@lmco.com'

Subject: Materials Question for new device...

#### Henry:

My name is Micah Johnson (we have spoke before on the SLAMMD Project) and I have a question regarding some materials issues on a new project that I working on currently. This project is still early in its development (requirements definition stage) but our team has already identified a possible candidate (COTS unit) to satisfy many of the "functional" requirements but just need to work out the environmental/workmanship/safety type requirements. Basically, the device in mind is an Air Sampling Device to be used on the shuttle and ISS. The unit which we are looking at is called the Sartorius Airport MD8. I will attach a brief overview for it with this email, but I wanted to get a feel (if possible) where the materials standpoint is on such a device.

At this time, I can tell you that the device is "housed" in a hardened polyurethane foam housing with a RAL 9016 urethane based (Alexit 401) finish/coating. Not exactly sure what's on the inside yet, but I do know the unit is going to be stowed for most of the time and is a hand-held device that will be battery powered. I know devices are normally preferred to have an aluminum housing but design and fabrication of an aluminum housing for this device would cost much more than the device itself and therefore not a real viable option for us. I am working on obtaining more information, but I wanted to pass this by you and see if you had any thoughts, concerns or feelings regarding this hardware. Obviously it would be nice to have Offgas data but right now I do not have any to provide.

Anyway, please let know what you think and of course let me know if you have no answers at this time and need more data/information and hopefully I can get some for you. Thanks for your time Henry!

#### Micah Johnson

Lockheed Martin Space Operations Phone: 281-483-7422 pgr: 281-527-0038

pgr: 281-327-0038 Cell: 512-554-4684

#### Outside:

Housing polyurethane foam.

Adapter in the housing for filter holder: aluminum AiCu MgPbF34137.

O-ring = perpunan DIN 3771-8L x 2,5-N-NBR 70

Countersunk head screw: 3x M4 x 20 DIN 963-A2 (Niro) steel

Pan head screw: M4 x 40 DIN84-Niro-A4 (niro ) steel

Display foil: polyester PVS-G (autotype EB Antiglave,  $130\mu m$ )

Laquer of housing: RAL 9016 urethan based, Alexit 401

Feet on the bottom part: PUR polyurethan.